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**Historical Aerial Photo Analysis
12th Street Dump Site
Wilmington, Delaware**

By

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Environmental Services
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NOTICE

As an interim product, this document has not gone through the complete EPA quality assurance cycle. Any errors that are discovered during preparation of the final report will be corrected therein.

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INTRODUCTION

This report presents the findings from an analysis of historical aerial photographs of the 12th Street Dump site, located in New Castle County, Wilmington, Delaware (Figure 1). The 12th Street Dump site is bounded on the east by a railroad line, on the west by the Brandywine Creek, and throughout most of the study period by a railroad spur to the north. The site covers approximately 5.6 hectares (14 acres). Fourteen years of historical photographs covering a study period from 1937 through 2002 (see References section) were analyzed and 11 photographs (1937, 1942, 1946, 1950, 1954, 1959, 1962, 1964, 1965, 1968, and 1977) were reproduced for inclusion in the report. This report was prepared in order to provide operational remote sensing support of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site investigations in EPA Region 3. Specifically, the research, acquisition, reproduction, and analysis of historical aerial photographs are needed in order to document landscape morphology, patterns of hazardous waste disposal, and other observable activities and conditions of environmental significance at the 12th Street Dump site, Wilmington, Delaware.

The findings of the historical aerial photographic analysis of the 12th Street Dump site presented in this report reveal that probable dredge spoil was noted on the site along the bank of Brandywine Creek in 1942 and in 1946 fill covered much of the northeast section of the site. A disposal area was operating on the site as early as 1950. Waste was disposed on the area through 1962. Disposal on the area appears to have ceased sometime between 1962 and April 1, 1964. By 1977 a fill area covered the location of the disposal area. Historical aerial photographs (1988, 1998, and 2002), analyzed but not included in this report, reveal that no environmentally significant changes were noted on the site after 1977.

A Glossary section, defining features or conditions identified in this report, follows the Aerial Photographic Analysis section. Sources for all maps, aerial photographs, and collateral data used in the production of this report are listed in the References section. Historical aerial photographs used in the analysis of this site have been digitally scanned and printed for use in this report. A transparent overlay with interpretative data is affixed to each of the digital prints. See the Methodology section for a discussion of the scanning and printing procedures.

METHODOLOGY

This report was prepared using a standard methodology that includes the following steps:

- data identification and acquisition,
- photographic analysis and interpretation, and
- graphics and text preparation.

These steps are described below. Subsections also address details related to specific kinds of analyses that may be required to identify environmental features such as surface drainage and wetlands. All operational steps and processes used to perform this work (including data identification and acquisition, photographic analysis and interpretation, and graphics and text preparation) adhere to strict QA/QC guidelines and standard operating procedures (SOPs). These guidelines and procedures are documented in the Master Quality Assurance Project Plan (QAPP) prepared for Remote Sensing Support Services Contract No. EP-D-05-088 (LMS, 2005).

Data Identification and Acquisition

Data identification and acquisition included a search of government and commercial sources of historical aerial film for the study area. Photographs with optimal spatial and temporal resolution and image quality were identified for acquisition. In addition, U.S. Geological Survey (USGS) topographic maps were obtained to show the study area location and to provide geographic and topographic context.

Photographic Analysis and Interpretation

To conduct this analysis, the analyst examined diapositives (transparencies) of historical aerial photographs showing the study area. Diapositives are most often used for analysis instead of prints because the diapositives have superior photographic resolution. They show minute details of significant environmental features that may not be discernible on a paper print.

A photographic analyst uses a stereoscope to view adjacent, overlapping pairs of diapositives on a backlit light table. In most cases, the stereoscope is capable of various magnifications up to 60 power. Stereoscopic viewing involves using the principle of parallax (observing a feature from slightly different positions) to observe a three-dimensional representation of the area of interest. The stereoscope enhances the photo interpretation process by allowing the analyst to observe vertical as well as horizontal spatial relationships of natural and cultural features. The process of photographic analysis involves the visual examination and comparison of many components of the photographic image. These components include shadow, tone, color, texture, shape, size, pattern, and landscape context of individual elements of a photograph. The photo analyst identifies objects, features, and "signatures" associated with specific environmental conditions or events. The term "signature" refers to a combination of components or characteristics that indicate a specific object, condition, or pattern of environmental significance. The academic and professional training, photo interpretation experience gained through repetitive observations of similar features or activities, and deductive logic of the analyst as well as background information from collateral sources (e.g., site maps, geologic reports, soil surveys) are critical factors employed in the photographic analysis.

Graphics and Text Preparation

The analyst records the results of the analysis by using a standard set of annotations and terminology to identify objects and features observed on the diapositives. Significant findings are annotated on overlays attached to the photographic or computer-reproduced prints in the report and discussed in the accompanying text. Annotations that are self-explanatory may not be discussed in the text. The annotations are defined in the legend that accompanies each print and in the text when first used. Objects and features are identified in the graphics and text according to the analyst's degree of confidence in the evidence. A distinction is made between certain and probable identifications. When the analyst believes the identification is unmistakable (certain), no qualifier is used. Probable is used when a limited number of discernible characteristics allow the analyst to be reasonably sure of a particular identification. The prints in this report have been reproduced, either by photographic or computer methods, from the original film. Reproductions are made from the original film and may be either contact (the same size) prints or enlargements, depending on the scale of the original film. Any computer-produced prints used in this report are generated from scans of the film at approximately 1,300 dots per inch (dpi) and printed at 720 dpi. Although the reproductions allow effective display of the interpretive annotations, they may have less photographic resolution than the original film. Therefore, some of the objects and features identified in the original image and described in the text may not be as clearly discernible on the prints in this report. Study area boundaries shown in this report were determined from aerial photographs or collateral data and do not necessarily denote legal property lines or ownership.

Some film vendors no longer supply analog film products (e.g., diapositive transparencies) to their customers. Digital files, created by scanning the original analog film products, are provided. The digital file, a representation of an original analog film product, can be analyzed either by computer viewing techniques or by creating a secondary diapositive from the digital file and viewing the secondary diapositive on a light table. The result of this process of converting an analog diapositive image to a digital file may be a reduction in the photographic resolution. A potential consequence of this in the realm of aerial photographic analysis is a lower confidence in the identification of features or conditions of environmental significance.

AERIAL PHOTOGRAPHIC ANALYSIS

October 16, 1937 (Figure 2)

The 12th Street Dump site generally appears to be a low-lying, vegetated, marshy depression between the railroad tracks located to the east and Brandywine Creek. A network of dirt roads provides access to the site and the three buildings on the site. The northmost access road, which extends southward from 12th Street, crosses a bridge over an unnamed tributary of Brandywine Creek before entering the site. The bridge is shared by the railroad spur that forms the northern border of the site.

An industrial facility, comprising one large building and numerous smaller buildings, is located northwest of the site. The railroad spur terminates at this industrial facility.

November 8, 1942 (Figure 3)

Probable dredge spoil has been deposited on the 12th Street Dump site along the bank of Brandywine Creek. The surface of the dredge spoil is partially vegetated. The two buildings, located in the center of the site in 1937, have been removed.

A fill area has been placed along 12th Street near the unnamed tributary to Brandywine Creek. The fill area extends into the low marshy area to the north. Mounds of dark- and light-toned material (not annotated) have been placed on the surface of the fill area.

March 12, 1946 (Figure 4)

Fill material has been spread into the low-lying, marshy depression in the northeast section of the 12th Street Dump site. Striations, indicative of the operation of heavy machinery, are visible across the surface of this area. Two drainage ditches, that channel flow to the west, have been constructed on the fill area.

The area east of the industrial facility is being used for the open storage of materials. Light-toned material and containers (not annotated) are housed in this storage area. A fill area has been placed along the bank of Brandywine Creek. Mounds of light-toned material (not annotated) have been placed along the fill face that extends toward the creek. The fill area in-place along 12th Street in 1942 has been expanded eastward and northward. Mounds of dark- and light-toned material (not annotated) have been deposited atop this fill area.

April 7, 1950 (Figure 5)

A disposal area is now operating in the northwest corner of the 12th Street Dump site. A dirt road, leading from 12th Street and the nearby industrial facility, affords access to this section of the site. Mounded waste (variously shaped and sized mounds of light-toned and dark-toned waste) has been placed along the west side of the disposal area. The west side of the mounded waste defines the active face of the disposal area. Drainage from the west side of the disposal area and also areas west of the disposal area appear to flow south and collect in an area of standing liquid southeast of the disposal area. The remainder of the site is inactive.

A building addition has been constructed on the east side of the industrial facility where an open storage area and fill area were noted in 1946. The fill area noted in 1942 and 1950 along 12th Street has continued to be expanded eastward and northward. Mounded material (not annotated) is visible on the surface of the fill area.

August 14, 1954 (Figure 6)

The northwest corner of the 12th Street Dump site, continues to be used as a disposal area. The access road that leads onto the disposal area now only emanates from the industrial facility. There does not appear to be any direct access onto the disposal area from 12th Street. The disposal area has been expanded to the east and mounded waste, composed of variously shaped and sized mounds of light-toned and dark-toned waste, has continued to be placed along the eastern active face of the disposal area. Scattered mounds of waste (not annotated) have been placed about the remainder of the disposal area.

Much of the area east of the industrial facility has been filled and graded. The fill area near the northwest corner of the site has covered over the unnamed tributary of Brandywine Creek. It appears that the tributary has been channelized under the fill area. Two culverts likely indicate the location of the channel. A short fence (not annotated), which partially defines the site boundary, extends to the railroad spur.

March 5, 1959 (Figure 7)

The northwest corner of the 12th Street Dump site continues to be used as a disposal area. The disposal area has been expanded to the east and mounded waste has continued to be placed along the eastern active face of the disposal area. The waste is composed of variously shaped and sized mounds of light-toned and dark-toned waste, and debris. Scattered mounds of waste (not annotated) have been placed about the remainder of the disposal area.

The area between the northwest site boundary and the buildings of industrial facility is being used for open storage. Mounds of light-toned material, tanks, and containers are housed in the area. A fence runs along the eastern edge of the open storage area. A road leads through an opening in the fence and provides access from the open storage area to the disposal area on the site. Another road enters the site near the eastern terminus of 12th Street and provides access to the northeastern section of the site.

June 16, 1962 (Figure 8)

Operations at the disposal area have continued on the 12th Street Dump site. Mounded waste has continued to be placed along the active face of the disposal area. The disposal area has been expanded to the east and also to the south. The waste is composed of variously shaped and sized mounds of light-toned and dark-toned waste, and debris. Scattered mounds of waste (not annotated) have been placed about the remainder of the disposal area.

The area between the northwest site boundary and the buildings of industrial facility continue to be used for open storage of light-toned material, tanks, and containers.

April 4, 1964 (Figure 9)

The areal extent of the disposal area on the 12th Street Dump site does not appear to have changed since 1962. However, the disposal area has remained active as indicated by the waste that has been added to mounded waste in the northeast section of the disposal area and light-toned mounds of waste (not annotated) that have been placed in the center of the disposal area. A dark-toned plume is visible in the standing liquid adjacent to the southeast portion of the disposal area. The plume likely indicates liquid leakage from the face of the disposal area. Probable debris (not annotated) has been scattered across the surface of the northernmost section of the site.

A large number of containers (not annotated) are stored in neatly stacked rows in the open storage area on the industrial facility located west of the site.

April 4, 1965 (Figure 10)

The disposal area located in the northwest corner of the 12th Street Dump site appears to have been inactive over the last year (April 4, 1964 through April 4, 1965). The areal extent of the disposal area and the waste material on it does not appear to have changed. The dark-toned plume, however, remains visible in the standing liquid adjacent to the southeast portion of the disposal area. This indicates that liquid leakage continues from the face of the disposal area. The probable debris (not annotated), noted in 1964 on the surface of the northernmost section of the site, remains visible. No new waste appears to have been added to the area. A fill area has been placed in the low-lying, marshy depression in the southern section of the site.

The open storage area on the industrial facility located west of the site houses light- and dark-toned material, and tanks. The containers noted in the open storage area in 1964 have been removed.

May 6, 1968 (Figure 11)

No new waste material appears to have been added to the probable disposal area located in the northwest corner of the 12th Street Dump site. The mounds of waste visible on the surface of the center of the area in 1964 and 1965 have been removed.

The open storage area on the industrial facility located west of the site houses light- and dark-toned material, containers, and tanks.

May 15, 1977 (Figure 12)

The disposal area on the 12th Street Dump site is no longer visible. A fill area has been placed atop this location and most of the remainder of the site. The fill area forms one large mound and its surface is vegetated. A road has been constructed that provides access to the industrial facility northwest of the site. In the northeast corner of the site 12th Street has been extended eastward to intersect with Interstate 95.

A building addition has been constructed on the industrial facility. The building addition is on the location of the former open storage area.

GLOSSARY

Access Road - A paved or unpaved route of vehicular access.

Building - A relatively permanent, essentially boxlike construction having a roof.

Container - Any portable device in which material is stored, transported, handled, or disposed.

Dark- , Medium- , or Light-Toned - Tones of features in question are compared with the darkest and lightest tones of gray (if using B&W photography) on the print.

Debris - The remains of anything that can be identified as being broken down, destroyed, demolished, or dismantled.

Face - The wall or slope of a mine, extraction, excavation, landfill, or fill area at which work is progressing (e.g., working face, fill face).

Fence - Man-made obstructive structure which regulates access in or out of a site, area, etc.

Fill - Earth, stones, or other material that is used to build up the level of an area of ground.

Fill Area - An area where material is being deposited to fill a depression; or area where materials have been added, altering the elevation of the ground surface.

Mounded Material - Piles of raw or waste materials on or in the vicinity of the site.

Open Storage Area - An area of open-air (outdoor) storage of containerized, raw or waste materials, within industrial or manufacturing sites.

Outfall - Discharge point of a waste stream into a body of water or the air.

Plume - The detectable emission from an outfall or smokestack.

Standing Liquid - A small, shallow, temporary collection of liquid, not necessarily waste. Not to include liquid contained in impoundments, trenches, pits, etc.

REFERENCES

MAPS:

U.S. Geological Survey Map, dated 1993. Scale: 1:24,000. Referenced in report as Figure 1.

AERIAL PHOTOGRAPHS:

- 10/16/37 photographs obtained from U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Salt Lake City, Utah. Source frame # 60. Original Scale: 1:20,000. Referenced in report as Figure 2.
- 11/08/42 source unknown. Source frame # 17. Original Scale: 1:20,000. Referenced in report as Figure 3.
- 03/12/46 photograph obtained from National Ocean Service, Coast and Geodetic Survey, Washington, D.C. Source frame # 220. Original Scale: 1:16,000. Referenced in report as Figure 4.
- 04/07/50 photograph obtained from U.S. Department of Interior, U.S. Geological Survey, Washington, D.C. Source frame # 157. Original Scale: 1:24,000. Referenced in report as Figure 5.
- 08/14/54 photograph obtained from U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Salt Lake City, Utah. Source frame # 209. Original Scale: 1:20,000. Referenced in report as Figure 6.
- 03/05/59 photograph obtained from Aerial Viewpoint, Inc., Spring, Texas. Source frame # 352. Original Scale: 1:24,000. Referenced in report as Figure 7.
- 06/16/62 photograph obtained from U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Salt Lake City, Utah. Source frame # 124. Original Scale: 1:20,000. Referenced in report as Figure 8.
- 04/04/64 source unknown. Source frame # 939. Original Scale: 1:20,000. Referenced in report as Figure 9.
- 04/04/65 photograph obtained from U.S. Department of Interior, U.S. Geological Survey, Washington, D.C. Source frame # 246. Original Scale: 1:24,000. Referenced in report as Figure 10.
- 05/06/68 photograph obtained from U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Salt Lake City, Utah. Source frame # 48. Original Scale: 1:20,000. Referenced in report as Figure 11.
- 05/15/77 photograph obtained from U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Salt Lake City, Utah. Source frame # 146. Original Scale: 1:40,000. Referenced in report as Figure 12.
- 06/10/1988 photograph obtained from U.S. Department of Interior, U.S. Geological Survey, Washington, D.C. Original Scale: 1:40,000. Photograph not reproduced in report.
- 03/31/1998 photograph obtained from U.S. Department of Interior, U.S. Geological Survey, Washington, D.C. Original Scale: 1:40,000. Photograph not reproduced in report.

•02/24/2002 photograph obtained from U.S. Department of Interior, U.S. Geological Survey, Washington, D.C.
Original Scale: 1:19,200. Photograph not reproduced in report.

OTHER MATERIALS:

LMS (Lockheed Martin Services). 2005. Master Quality Assurance Project Plan. Prepared for EPA Environmental Sciences Division. Contract EP-D-05-088. Las Vegas, Nevada.